Claims

What is claimed is:

1. A method for periodically broadcasting media content, the method comprising the steps of:

creating a plurality of levels for the media content; and

periodically transmitting each level.

2. The method of claim 1, wherein the step of creating a plurality of levels for the media content comprises creating two levels for the media content.

3. The method of claim 1, wherein:

the step of creating further comprises the step of creating a plurality of levels of detail; and

the step of periodically transmitting further comprises the step of periodically transmitting each level of detail.

4. The method of claim 1, wherein:

the step of creating further comprises the step of creating a plurality of levels of importance; and

the step of periodically transmitting further comprises the step of periodically transmitting each level of importance.

5. The method of claim 1, wherein the step of creating further comprises the step of creating a plurality of levels wherein no level contains information from the media

content that is in another level.

6. The method of claim 1, wherein each level comprises an amount of data that is less than an amount of data in the media content.

7. The method of claim 1, wherein combining data from all of the levels provides an exact representation of the media content.

8. The method of claim 1, wherein combining data from all of the levels does not provide an exact representation of the media content.

9. The method of claim 1, wherein the media content comprises one or more of stroke data, video, audio, text, images, a slide sequence, a three-dimensional sequence, and an animation.

10. The method of claim 1, wherein one of the levels has less data than another level, and wherein the method further comprises the step of assigning a higher bandwidth to the one level than is assigned to the other level.

11. The method of claim 1, wherein one of the levels is more important than another level, and wherein the method further comprises the step of assigning a higher bandwidth to the one level than is assigned to the other level.

12. The method of claim 1, further comprising the steps of:

assigning a minimum latency for each of the levels; and

determining a bandwidth for each level of detail by using a corresponding one of the minimum latencies.

13. The method of claim 1, wherein the step of periodically transmitting each level further comprises the step of interleaving the levels.

14. The method of claim 1, wherein the step of periodically transmitting each level further comprises the steps of:

determining a predetermined latency for each level; and

transmitting each level within a corresponding predetermined latency.

15. The method of claim 1, wherein:

the media content comprises a plurality of indivisible units;

the step of creating further comprises selecting some of the indivisible units for each level; and

the step of periodically transmitting further comprises the step of interleaving each of the levels into an output stream.

16. The method of claim 1, wherein:

the media content comprises a plurality of divisible units;

the step of creating further comprises processing each divisible unit into a plurality of levels; and

the step of periodically transmitting further comprises the step of interleaving levels from each divisible unit into an output stream.

17. The method of claim 16, wherein each of the divisible units comprises stroke data determined from a whiteboard at a certain time.

18. The method of claim 1, further comprising the steps of:

receiving each of the levels; and

displaying some of the levels through the following steps:

selecting some of the plurality of levels to display; and

reconstructing part or all of the media content by combining the selected levels.

19. A method comprising the steps of:

determining original stroke data from a whiteboard;

for each of a plurality of levels of detail, determining predicted stroke data from the original stroke data; and

periodically transmitting the predicted stroke data for each level of detail.

20. The method of claim 19, wherein the step of periodically transmitting further comprises the steps of:

determining a latency for each level of detail; and

transmitting each level of detail within its respective latency.

21. The method of claim 20, further comprising the step of determining bandwidth for each level of detail by using a respective latency.

22. The method of claim 19, wherein the step of determining predicted stroke data further comprises the steps of:

for a lowest level of detail, determining segmentation points of the original stroke data and using the segmentation points as the predicted stroke data for the lowest level of detail; and

for higher levels of detail, determining feature points determined by using an area-based error method that uses points in a lower level of detail, wherein the feature points are used as the predicted stroke data.

23. The method of claim 22, wherein the step of determining feature points determined by using an area-based error method that uses points in a lower level of detail further comprises the steps of:

determining two points that are contained in a lower level of detail; and

iterating the following steps until a first area is within a predetermined amount from a second area:

selecting a prediction point from the original stroke data, wherein the prediction point is between the two points on a line formed by the original stroke data;

selecting a local point immediately prior to or after the prediction point on the line formed by the original stroke data;

determining the first area of a triangle formed by the prediction point, one of the two points, and the local point;

determining the second area of a triangle formed by the prediction point, the other of the two points, and the local point;

comparing the first and second areas; and

when the first area is within a predetermined amount from the second area, selecting the prediction point as a feature point.

24. The method of claim 19, further comprising the steps of:

receiving a set of the levels of detail; and

displaying this set of the levels of detail by combining points from the each level of detail in the set.

25. A method comprising the steps of:

storing a plurality of data elements in a data structure;

defining a data structure description that describes the data elements in the data structure;

defining, by using the data structure description, one or more links, each of the links locating one or more data elements in the data structure; and

retrieving, by using one of the links, a corresponding one of the data elements.

26. The method of claim 25, wherein:

the data structure comprises one or more of a hierarchical data structure comprised of subgraphs, a serial stream, and an ordered set comprised of subsets, wherein each data element has one or more of a node position, a bit position and a subset position;

the step of defining a data structure description further comprises the step of defining at least one general mask; and

the step of defining one or more links further comprises the step of defining, using the general mask, a particular mask comprising one or more links, each of

the links providing access to a data element.

27. The method of claim 25, wherein:

the data structure comprises a hierarchical data structure comprised of subgraphs, wherein each data element has a node position;

the step of defining a data structure description further comprises the step of defining a general graph mask; and

the step of defining one or more links further comprises the step of defining, using the general graph mask, a particular graph mask comprising one or more subgraph links, each of the subgraph links providing access to a data element at its node position.

28. The method of claim 25, wherein:

the data structure comprises a serial stream, wherein each data element has a data bit position within the serial stream;

the step of defining a data structure description further comprises the step of defining a general space mask; and

the step of defining one or more links further comprises the step of defining, using the general space mask, a particular space mask comprising one or more subinterval links, each of the subinterval links providing access to a data element at its bit position.

29. The method of claim 25, wherein:

the data structure comprises an ordered set comprised of subsets, wherein each data element belongs to a subset;

the step of defining a data structure description further comprises the step of defining a general data set mask; and

the step of defining one or more links further comprises the step of defining a particular data set mask comprising one or more subset links, each of the subset links providing access to a data element in its subset.

30. A system for periodically broadcasting media content, comprising:

a memory that stores computer-readable code; and

a processor operatively coupled to the memory, the processor configured to implement the computer-readable code, the computer-readable code configured to:

create a plurality of levels for the media content; and

periodically transmit each level.

31. The system of claim 30, wherein:

the computer-readable code is further configured, when creating, to create a plurality of levels of detail; and

the computer-readable code is further configured, when periodically transmitting, to periodically transmit each level of detail.

32. The system of claim 30, wherein:

the computer-readable code is further configured, when creating, to create a plurality of levels of importance; and

the computer-readable code is further configured, when periodically transmitting, to periodically transmit each level of importance.

33. The system of claim 30, wherein the media content comprises one or more of stroke data, video, audio, text, images, a slide sequence, a three-dimensional sequence, and an animation.

34. The system of claim 30, wherein one of the levels has less data than another level, and wherein the computer-readable code is further configured to assign a higher bandwidth to the one level than is assigned to the other level.

35. The system of claim 30, wherein one of the levels is more important than another level, and wherein the computer-readable code is further configured to assign a higher bandwidth to the one level than is assigned to the other level.

36. The system of claim 30, wherein the computer-readable code is further configured to:

assign a minimum latency for each of the levels; and

determine a bandwidth for each level of detail by using a corresponding one of the minimum latencies.

37. The system of claim 30, wherein the computer-readable code is further configured to:

receive each of the levels; and

display some of the levels through the following steps:

select some of the plurality of levels to display; and

reconstruct part or all of the media content by combining the selected levels.

38. A system for periodically broadcasting levels of detail of stroke data, comprising:

a memory that stores computer-readable code; and

a processor operatively coupled to the memory, the processor configured to implement the computer-readable code, the computer-readable code configured to:

determine original stroke data from a whiteboard;

for each of a plurality of levels of detail, determine predicted stroke data from the original stroke data; and

periodically transmit the predicted stroke data for each level of detail.

39. The system of claim 38, wherein the computer-readable code is further configured, when determining predicted stroke data, to:

for a lowest level of detail, determine segmentation points of the original stroke data and using the segmentation points as the predicted stroke data for the lowest level of detail; and

for higher levels of detail, determine feature points determined by using an area-based error method that uses points in a lower level of detail, wherein the feature points are used as the predicted stroke data.

40. A system comprising:

a memory that stores computer-readable code; and

a processor operatively coupled to the memory, the processor configured to implement the computer-readable code, the computer-readable code configured to:

store a plurality of data elements in a data structure;

define a data structure description that describes the data elements in the data structure;

define, by using the data structure description, one or more links, each of the links locating one or more data elements in the data structure; and

retrieve, by using one of the links, a corresponding one of the data elements.

41. The system of claim 40, wherein:

the data structure comprises one or more of a hierarchical data structure comprised of subgraphs, a serial stream, and an ordered set comprised of subsets, wherein each data element has one or more of a node position, a bit position and a subset position;

the computer-readable code is further configured, when defining a data structure description, to define at least one general mask; and

the computer-readable code is further configured, when defining one or more links, to define, using the general mask, a particular mask comprising one or more links, each of the links providing access to a data element.

42. The system of claim 40, wherein:

the data structure comprises a hierarchical data structure comprised of subgraphs, wherein each data element has a node position;

the computer-readable code is further configured, when defining a data structure description, to define a general graph mask; and

the computer-readable code is further configured, when defining one or more links, to define, using the general graph mask, a particular graph mask comprising one or more subgraph links, each of the subgraph links providing access to a data element

at its node position.

43. The system of claim 40, wherein:

the data structure comprises a serial stream, wherein each data element has a data bit position within the serial stream;

the computer-readable code is further configured, when defining a data structure description, to define a general space mask; and

the computer-readable code is further configured, when defining one or more links, to define, using the general space mask, a particular space mask comprising one or more subinterval links, each of the subinterval links providing access to a data element at its bit position.

44. The system of claim 40, wherein:

the data structure comprises an ordered set comprised of subsets, wherein each data element belongs to a subset;

the computer-readable code is further configured, when defining a data structure description, to define a general data set mask; and

the computer-readable code is further configured, when defining one or more links, to define a particular data set mask comprising one or more subset links, each of the subset links providing access to a data element in its subset.

45. An article of manufacture comprising:

a computer-readable medium having computer-readable code means embodied thereon, the computer-readable program code means comprising:

a step to create a plurality of levels for the media content; and

a step to periodically transmit each level.

46. The article of manufacture of claim 45, wherein:

the computer-readable program code means further comprises, when creating, a step to create a plurality of levels of detail; and

the computer-readable program code means further comprises, when periodically transmitting, a step to periodically transmit each level of detail.

47. The article of manufacture of claim 45, wherein:

the computer-readable program code means further comprises, when creating, a step to create a plurality of levels of importance; and

the computer-readable program code means further comprises, when periodically transmitting, a step to periodically transmit each level of importance.

48. The article of manufacture of claim 45, wherein the media content comprises one or more of stroke data, video, audio, text, images, a slide sequence, a three-dimensional sequence, and an animation.

49. The article of manufacture of claim 45, wherein one of the levels has less data than another level, and wherein the computer-readable program code means further comprises a step to assign a higher bandwidth to the one level than is assigned to the other level.

50. The article of manufacture of claim 45, wherein one of the levels is more important than another level, and wherein the computer-readable program code means

further comprises a step to assign a higher bandwidth to the one level than is assigned to the other level.

51. The article of manufacture of claim 45, wherein the computer-readable program code means further comprises:

a step to assign a minimum latency for each of the levels; and

a step to determine a bandwidth for each level of detail by using a corresponding one of the minimum latencies.

52. The article of manufacture of claim 45, wherein the computer-readable program code means further comprises:

a step to receive each of the levels; and

a step to display some of the levels through the following steps:

a step to select some of the plurality of levels to display; and

a step to reconstruct part or all of the media content by combining the selected levels.

53. An article of manufacture comprising:

a computer-readable medium having computer-readable code means embodied thereon, the computer-readable program code means comprising:

a step to determine original stroke data from a whiteboard;

for each of a plurality of levels of detail, a step to determine predicted stroke data from the original stroke data; and

a step to periodically transmit the predicted stroke data for each level of

detail.

54. The article of manufacture of claim 53, wherein the computer-readable program code means further comprises, when determining predicted stroke data:

for a lowest level of detail, a step to determine segmentation points of the original stroke data and using the segmentation points as the predicted stroke data for the lowest level of detail; and

for higher levels of detail, a step to determine feature points determined by using an area-based error method that uses points in a lower level of detail, wherein the feature points are used as the predicted stroke data.

55. An article of manufacture comprising:

a computer-readable medium having computer-readable code means embodied thereon, the computer-readable program code means comprising:

a step to store a plurality of data elements in a data structure;

a step to define a data structure description that describes the data elements in the data structure;

a step to define, by using the data structure description, one or more links, each of the links locating one or more data elements in the data structure; and

a step to retrieve, by using one of the links, a corresponding one of the data elements.

56. The article of manufacture of claim 55, wherein:

the data structure comprises one or more of a hierarchical data structure comprised of subgraphs, a serial stream, and an ordered set comprised of subsets, wherein

each data element has one or more of a node position, a bit position and a subset position;

the computer-readable program code means further comprises, when defining a data structure description, a step to define at least one general mask; and

the computer-readable program code means further comprises, when defining one or more links, a step to define, using the general mask, a particular mask comprising one or more links, each of the links providing access to a data element.

57. The article of manufacture of claim 55, wherein:

the data structure comprises a hierarchical data structure comprised of subgraphs, wherein each data element has a node position;

the computer-readable program code means further comprises, when defining a data structure description, a step to define a general graph mask; and

the computer-readable program code means further comprises, when defining one or more links, a step to define, using the general graph mask, a particular graph mask comprising one or more subgraph links, each of the subgraph links providing access to a data element at its node position.

58. The article of manufacture of claim 55, wherein:

the data structure comprises a serial stream, wherein each data element has a data bit position within the serial stream;

the computer-readable program code means further comprises, when defining a data structure description, a step to define a general space mask; and

the computer-readable program code means further comprises, when defining one or more links, a step to define, using the general space mask, a particular space mask comprising one or more subinterval links, each of the subinterval links

providing access to a data element at its bit position.

59. The article of manufacture of claim 55, wherein:

the data structure comprises an ordered set comprised of subsets, wherein each data element belongs to a subset;

the computer-readable program code means further comprises, when defining a data structure description, a step to define a general data set mask; and

the computer-readable program code means further comprises, when defining one or more links, a step to define a particular data set mask comprising one or more subset links, each of the subset links providing access to a data element in its subset.